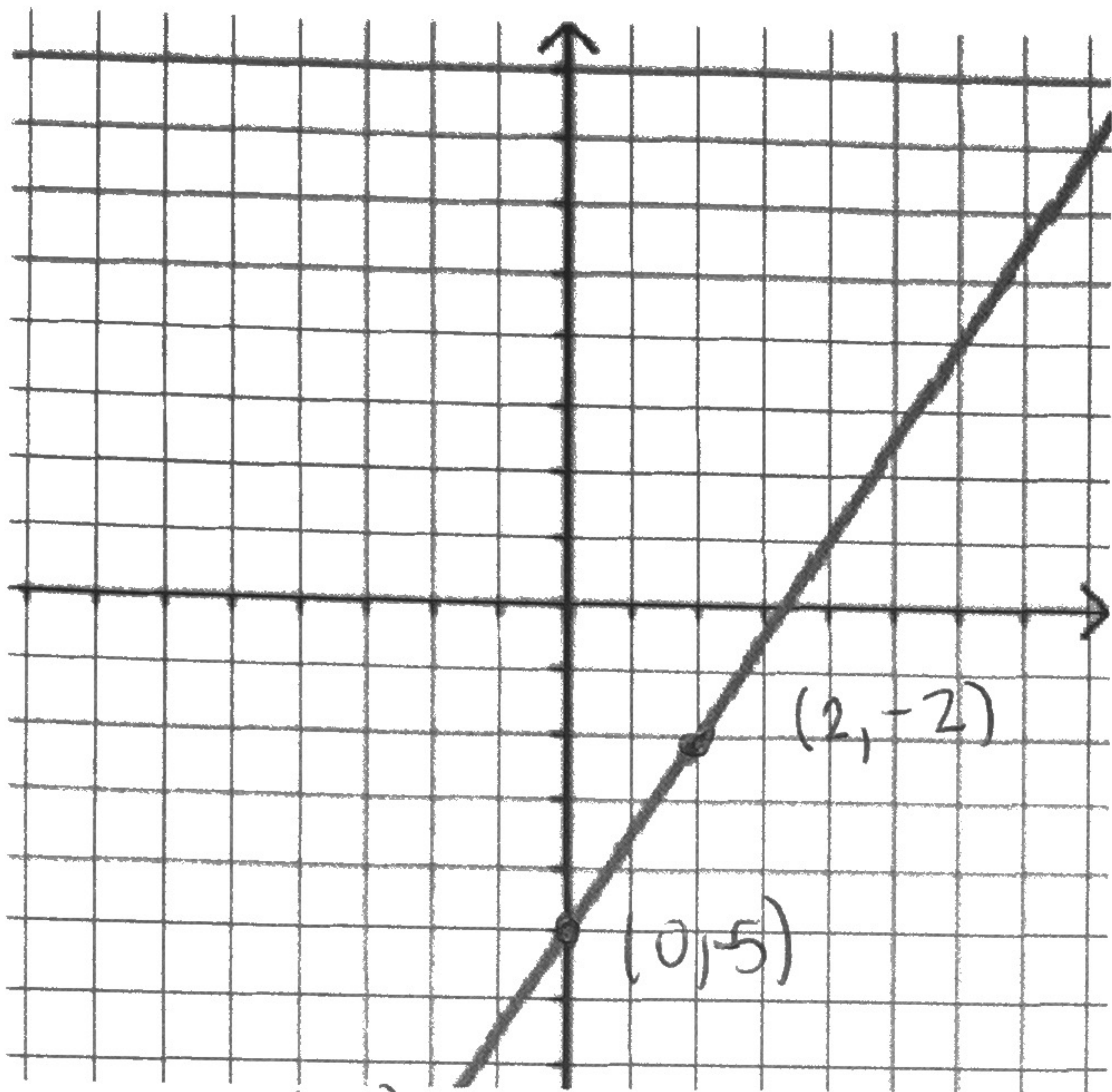


### Characteristics of Functions

1. Identify the characteristics of each function shown below.



$$m = \frac{-5 - (-2)}{0 - 2} = \frac{-3}{-2} = \frac{3}{2}$$

Equation of Line:  $y = \frac{3}{2}x - 5$

Domain:  $\mathbb{R}$

Range:  $\mathbb{R}$

y-intercept:  $(0, -5)$   $0 = \frac{3}{2}x - 5$

x-intercept:  $(\frac{10}{3}, 0)$   $5 = \frac{3}{2}x$

Interval of Increasing:  $\mathbb{R}$   $x = \frac{10}{3}$

Interval of Decreasing: none

Max: none Min: none

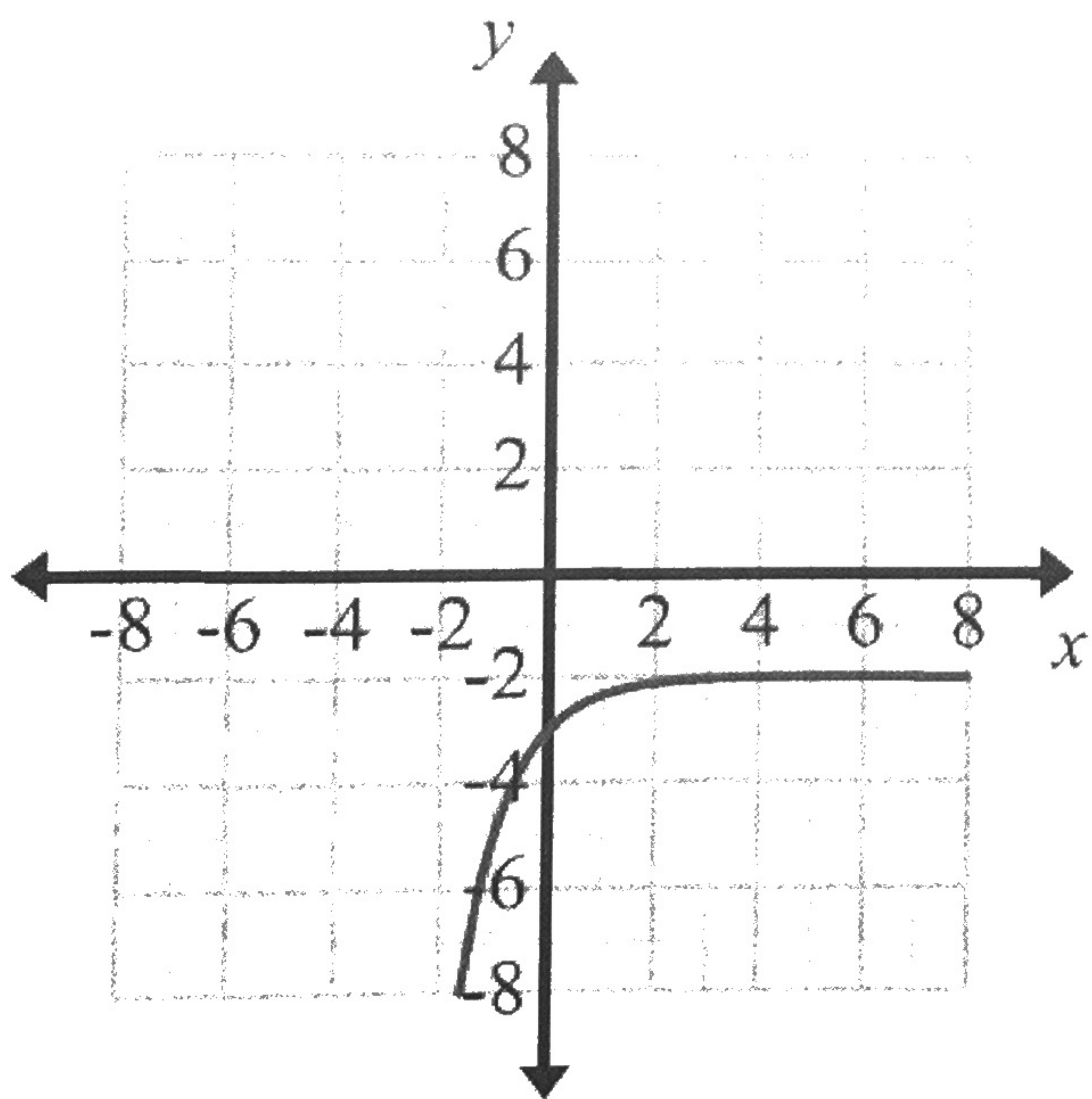
Rate of Change over the interval  $[0, 2]$ :

End Behavior:

As  $x \rightarrow \infty, f(x) \rightarrow \infty$

As  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

2.



Domain:  $\mathbb{R}$

Range:  $y < -2$

x-intercept: none

y-intercept:  $(0, -3)$

Asymptote:  $y = -2$

Interval of Increasing:  $(-\infty, \infty)$

Interval of Decreasing: none

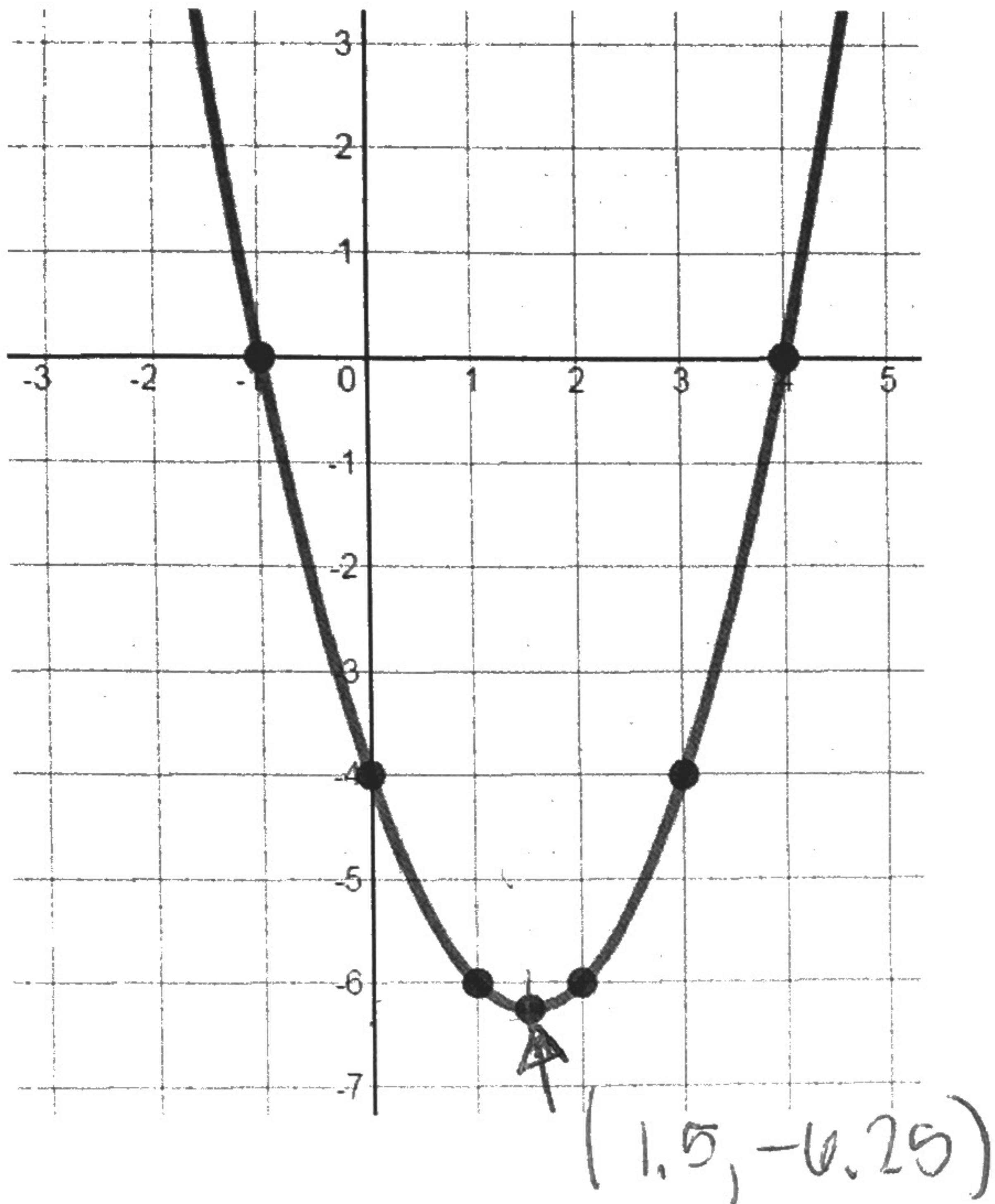
Max: none Min: none

End Behavior:

As  $x \rightarrow \infty, f(x) \rightarrow -2$

As  $x \rightarrow -\infty, f(x) \rightarrow -\infty$

3.



Function:  $y = x^2 - 3x - 4$

Domain:  $\mathbb{R}$

Range:  $y > -6.25$  or  $[-6.25, \infty)$

Interval(s) of increase:  $(1.5, \infty)$

Interval(s) of decrease:  $(-\infty, 1.5)$

Maximum(s): none

Minimum(s):  $(1.5, -6.25)$

x-intercept(s):  $(-1, 0)$  and  $(4, 0)$

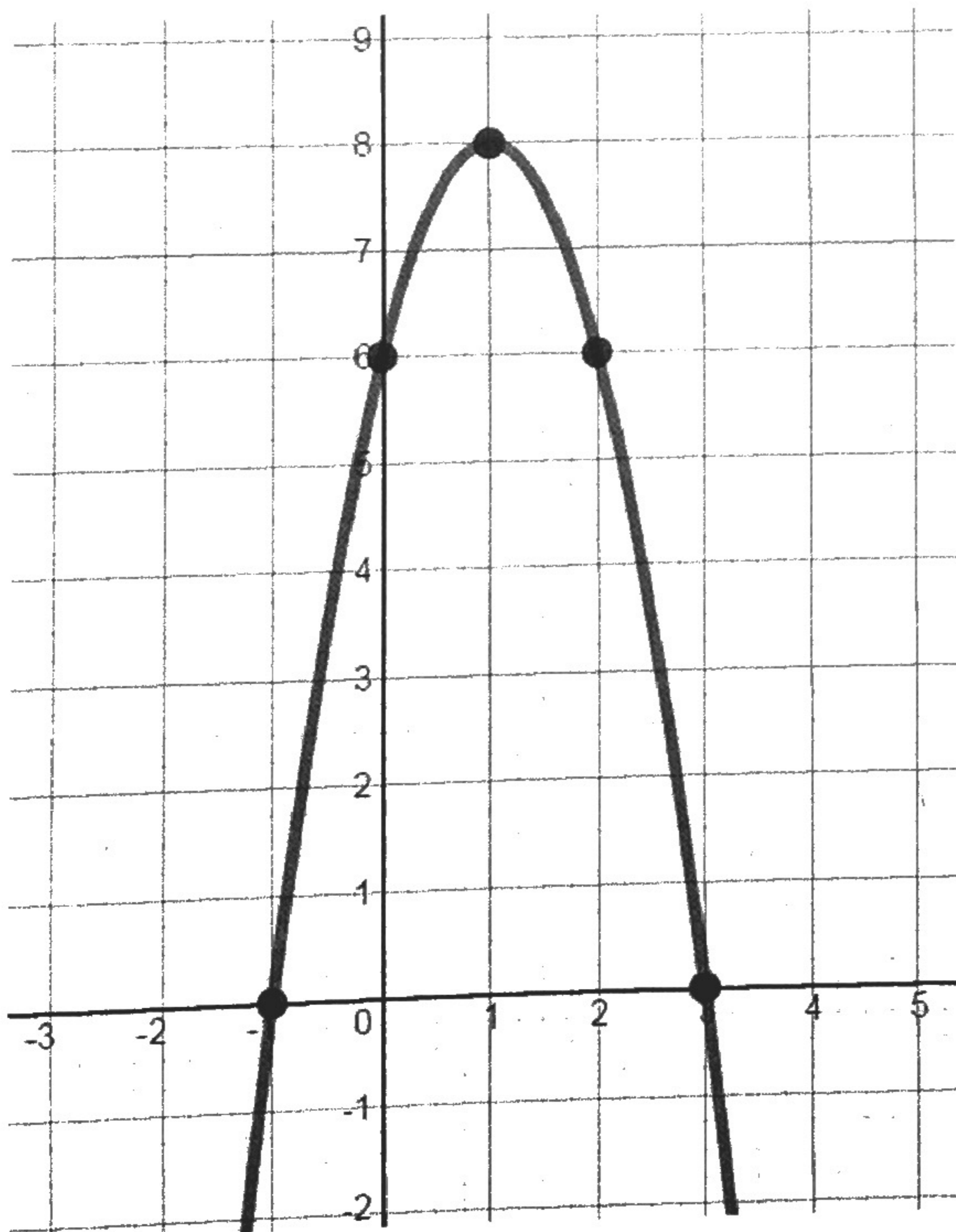
y-intercept:  $(0, -4)$

What is the end behavior?

As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow \infty$

As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$

4.



Function:  $y = -2x^2 + 4x + 6$

Domain:  $\mathbb{R}$

Range:  $y < 8$  or  $(-\infty, 8]$

Interval(s) of increase:  $(-\infty, 1)$

Interval(s) of decrease:  $(1, \infty)$

Maximum(s):  $(1, 8)$

Minimum(s): none

x-intercept(s):  $(-1, 0)$  and  $(3, 0)$

y-intercept:  $(0, 6)$

What is the end behavior?

As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow -\infty$

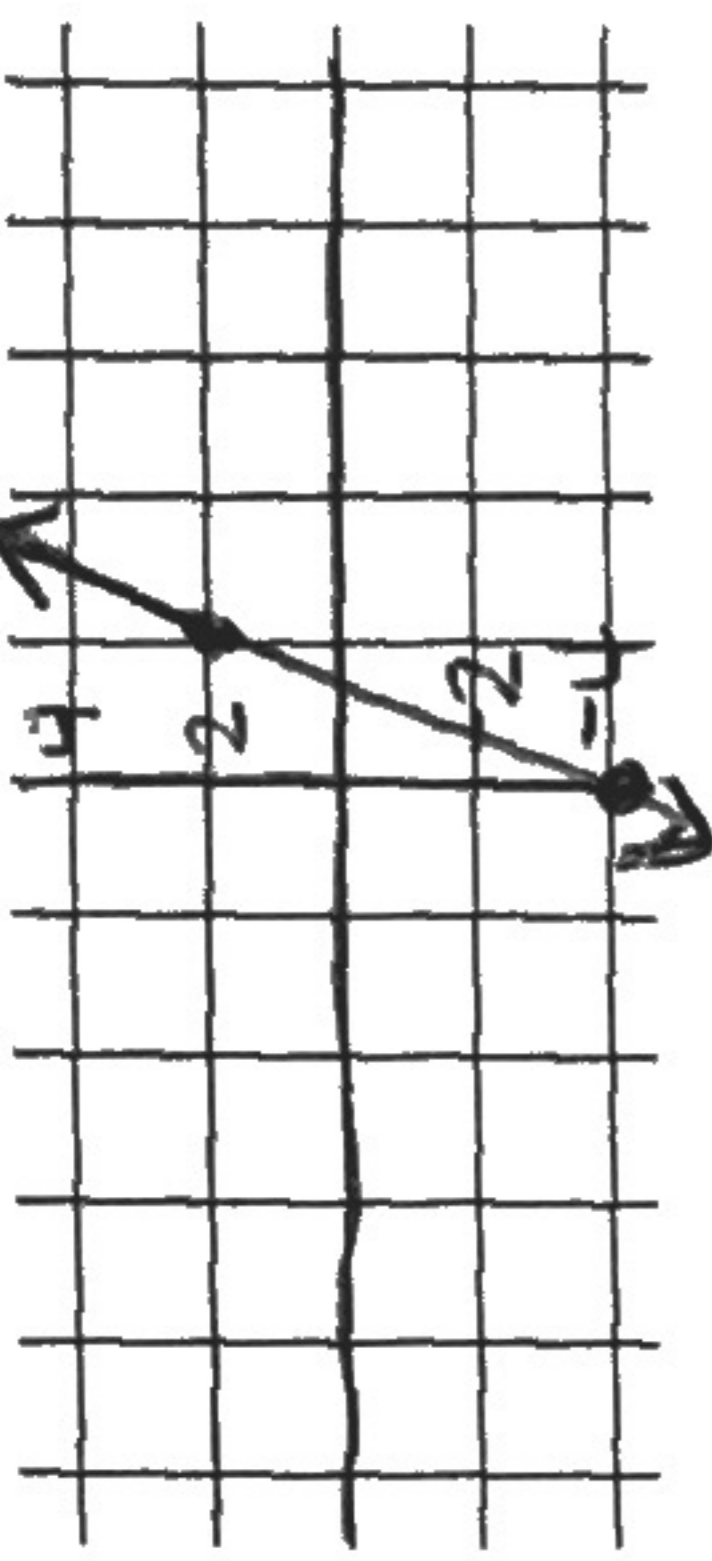
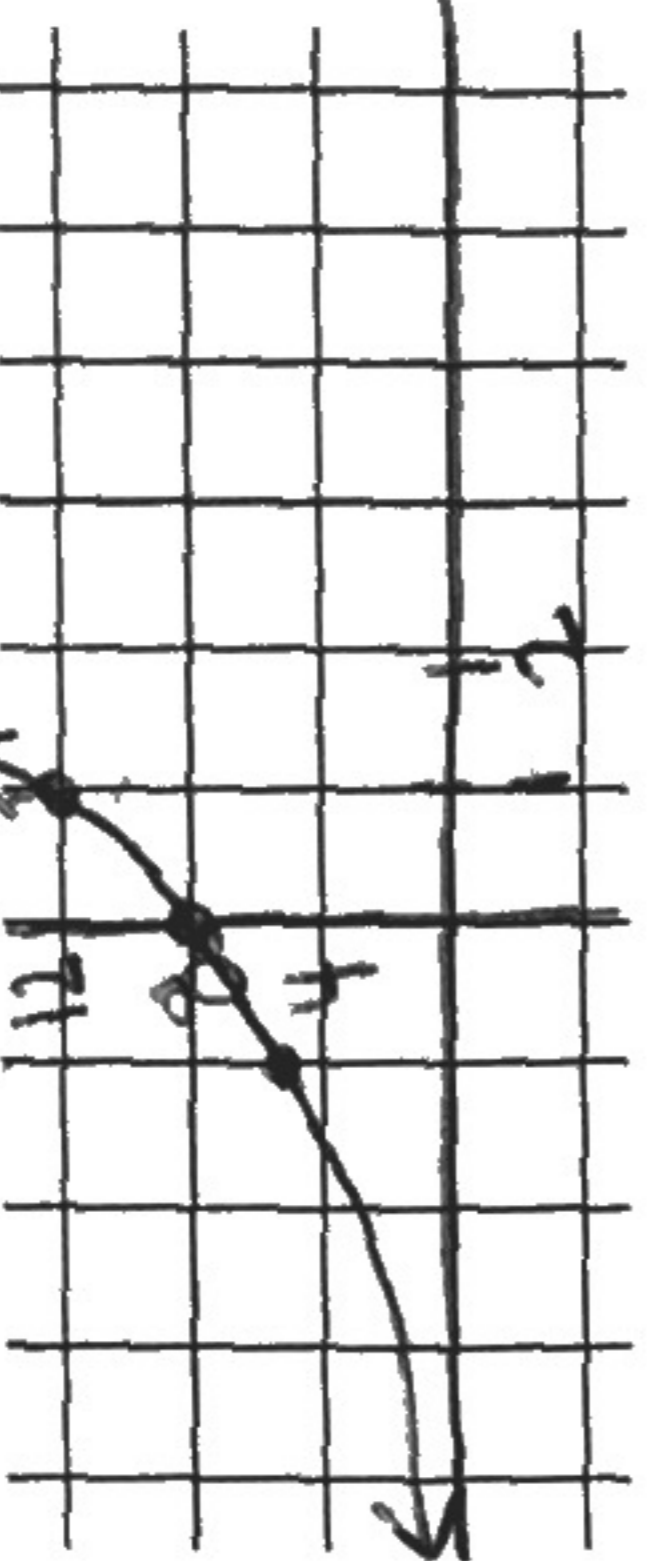
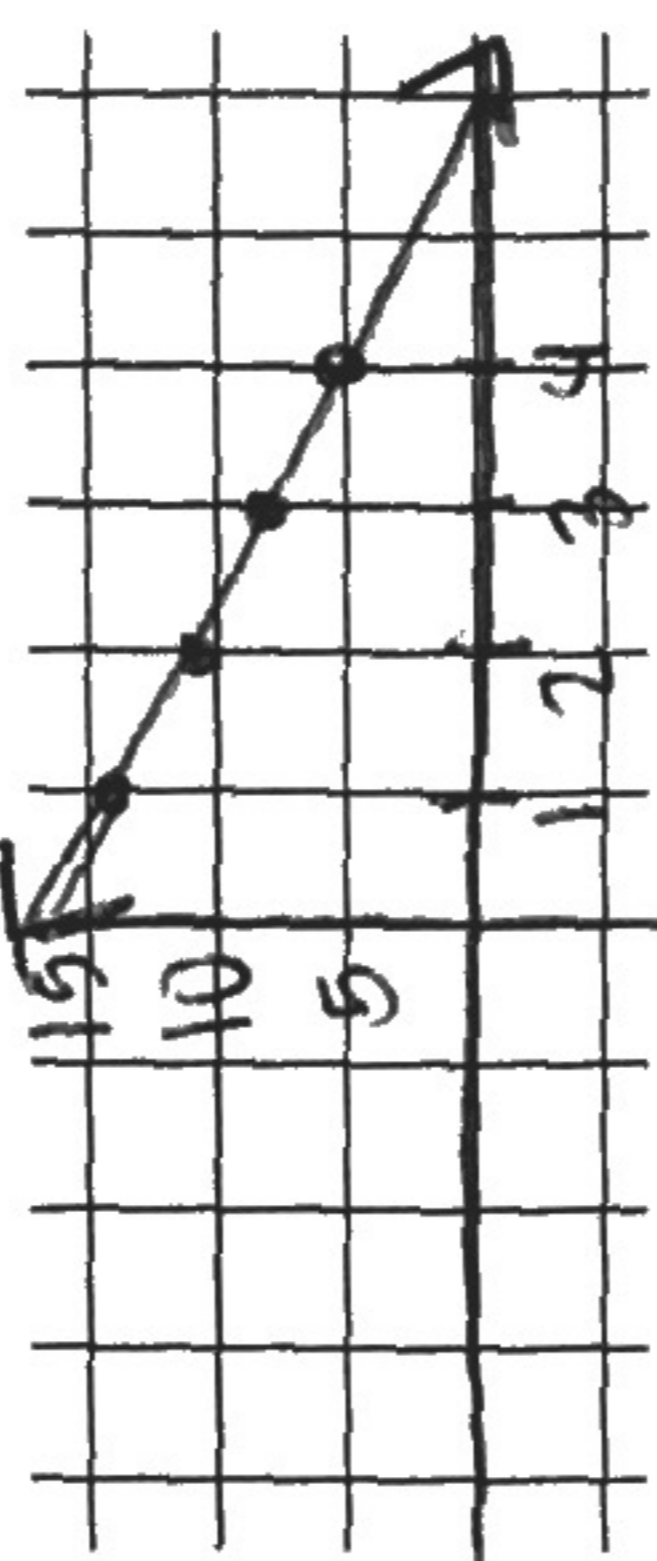
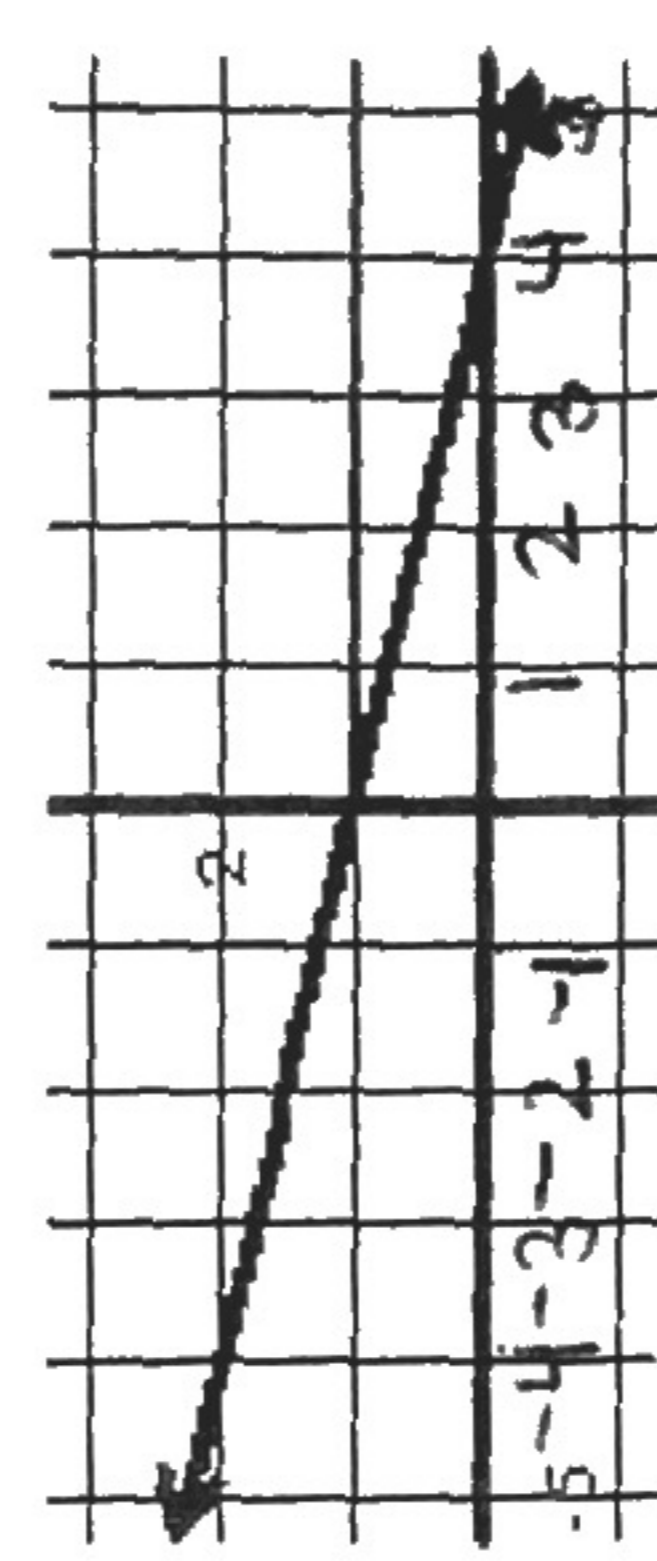


As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$

# Linear & Exponential Summary and Practice

Name \_\_\_\_\_

Period \_\_\_\_\_ Date \_\_\_\_\_

	Linear	Exponential																																								
Definition	If input increases by 1, then a certain amount (SLOPE / COMMON DIFFERENCE) is ADDED to the output	If input increases by 1, then a certain amount (COMMON RATIO) is MULTIPLIED with the output																																								
Description	Recursive Definition: "ADD ___ each time"  (Common difference is ___; y-intercept is ___)	Recursive Definition: "MULTIPLY by ___ each time"  (Common ratio is ___; y-intercept is ___)																																								
Equation	<p>Continuous graph</p> $y = mx + b$ <p><math>m</math> = slope <math>b</math> = y-intercept</p> <p>Sequence (Explicit Definition)</p> $a_n = d(n - 1) + a_1$ <p><math>d</math> = common difference <math>z</math> = "zeroth" term (what would come <u>before</u> the first term)</p>	<p>Continuous graph</p> $y = a(r)^{n-1}$ <p><math>r</math> = common ratio <math>a</math> = y-intercept</p> <p>Sequence (Explicit Definition)</p> $a_n = a_1 (r)^{n-1}$ <p><math>r</math> = common ratio <math>z</math> = "zeroth" term (what would come <u>before</u> the first term)</p>																																								
Table	<table border="1"> <tr><td><math>x</math></td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td><math>y</math></td><td>2</td><td>5</td><td>8</td><td>11</td></tr> </table> <p>or</p> <table border="1"> <tr><td><math>n</math></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td><math>a_n</math></td><td>8</td><td>11</td><td>14</td><td>17</td></tr> </table> <p>output <u>increases by 2</u> each time input increases by 1</p>	$x$	-1	0	1	2	$y$	2	5	8	11	$n$	1	2	3	4	$a_n$	8	11	14	17	<table border="1"> <tr><td><math>x</math></td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td><math>y</math></td><td>2.5</td><td>5</td><td>10</td><td>20</td></tr> </table> <p>or</p> <table border="1"> <tr><td><math>n</math></td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td><math>a_n</math></td><td>10</td><td>20</td><td>40</td><td>80</td></tr> </table> <p>output <u>doubles</u> each time input increases by 1</p>	$x$	-1	0	1	2	$y$	2.5	5	10	20	$n$	1	2	3	4	$a_n$	10	20	40	80
$x$	-1	0	1	2																																						
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$n$	1	2	3	4																																						
$a_n$	10	20	40	80																																						
Graph	<p>General: <math>d &gt; 0</math> (increasing)   <math>d &lt; 0</math> (decreasing)</p>	<p>General: <math>r &gt; 1</math> (growth)   <math>0 &lt; r &lt; 1</math> (decay)</p>																																								

Description	Equation	Table	Graph										
1. The common difference is 6; the y-intercept is -4	$y = 6x - 4$	<table border="1"> <tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>y</td><td>-10</td><td>-4</td><td>2</td><td>8</td></tr> </table>	x	-1	0	1	2	y	-10	-4	2	8	
x	-1	0	1	2									
y	-10	-4	2	8									
2. the common ratio is 1.5; the initial value is 8	$y = 8 \cdot 1.5^x$	<table border="1"> <tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>y</td><td><math>10/3</math></td><td>8</td><td>12</td><td>18</td></tr> </table> <p style="text-align: center;"><math>= 5.3</math></p>	x	-1	0	1	2	y	$10/3$	8	12	18	
x	-1	0	1	2									
y	$10/3$	8	12	18									
3. the common difference is -3; the y-intercept is 17	$y = -3x + b$ $14 = -3(1) + b$ $b = 17$ $y = -3x + 17$	<table border="1"> <tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>y</td><td>14</td><td>11</td><td>8</td><td>5</td></tr> </table> <p style="text-align: center;"><math>-3</math>   <math>-3</math>   <math>-3</math></p>	x	1	2	3	4	y	14	11	8	5	
x	1	2	3	4									
y	14	11	8	5									
4. the common difference is -1/2; the y-intercept is 1.	$y = -\frac{1}{2}x + 1$	<table border="1"> <tr><td>x</td><td>-2</td><td>0</td><td>2</td><td>4</td></tr> <tr><td>f(x)</td><td>1.5</td><td>1</td><td>0.5</td><td>0</td></tr> </table>	x	-2	0	2	4	f(x)	1.5	1	0.5	0	
x	-2	0	2	4									
f(x)	1.5	1	0.5	0									
5. the common ratio is 1/2. the initial value is 16	$8 = a(\frac{1}{2})^1$ $8 = \frac{1}{2}a$ $a = 16$ $y = 16(\frac{1}{2})^x$	<table border="1"> <tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>F(x)</td><td>8</td><td>4</td><td>2</td><td>1</td></tr> </table> <p style="text-align: center;"><math>x \cdot \frac{1}{2}</math>   <math>x \cdot \frac{1}{2}</math>   <math>x \cdot \frac{1}{2}</math></p>	x	1	2	3	4	F(x)	8	4	2	1	
x	1	2	3	4									
F(x)	8	4	2	1									
6. the common difference is 3; the y-intercept is -5.	$y = 3x - 5$	<table border="1"> <tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>F(x)</td><td>-8</td><td>-5</td><td>-2</td><td>1</td></tr> </table>	x	-1	0	1	2	F(x)	-8	-5	-2	1	
x	-1	0	1	2									
F(x)	-8	-5	-2	1									